



| ACCURAIID ARI08X



QUICK INSTALLATION GUIDE v1.0

About this manual

Thank you for using products from **Sans Digital**. This manual will introduce to you the Sans Digital AccuRAID series products and help you understand the operations of the RAID system. The information stated in this manual was thoroughly confirmed before publication; however, the specifications for the shipping production will be standard. For any product specification or related updates, please go directly to **www.sansdigital.com**. Sans Digital will not issue notices separately. For any questions for **Sans Digital**'s products or latest product information, manuals or firmware, contact **info@sansdigital.com** and we will respond shortly.

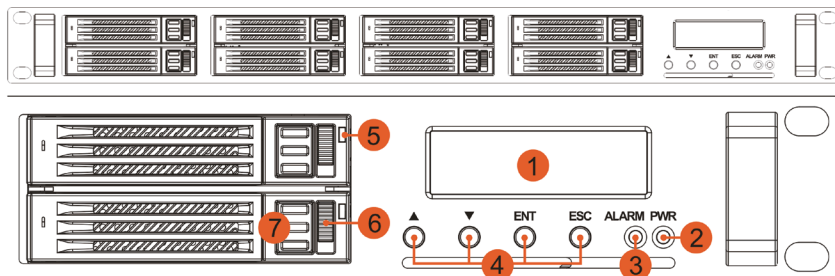
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AR108X SW / HW Quick Installation Guide

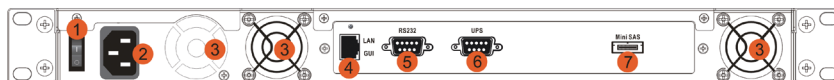
1. Product Diagrams and Contents of Product Package

Front View



- ① LCD Display
- ② Power LED Indicator (PWR)
- ③ Alarm LED Indicator (ALARM)
- ④ Functional Button (UP/DOWN/ENT/ESC)
- ⑤ HDD Status Indicator
- ⑥ Tray Lock
- ⑦ Button for Tray Clamp

Rear View



- ① Power Switch
- ② Power Connector
- ③ Cooling Fan
- ④ LAN GUI
- ⑤ RS232
- ⑥ UPS
- ⑦ Mini SAS

Contents of Product Package

Description	Qty.
AR108X Device	1
AC Power Cable	1
Mini SAS to Mini SAS Cable	1
RS-232 Cable	1
Quick Installation Guide	1
CD (User Guide)	1
Accessory Kit	1

Please make sure that related accessories and the product body are not damaged or missing. If you have any questions, please contact Sans Digital.

2. Product Specifications

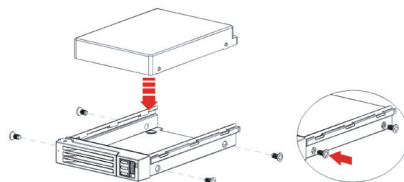
Model No.	AR108X
Chipset	Intel IOP80331
RAM Capacity	512MB
Host Interface	Mini SAS
Support HDD	8×2.5" SATA 3.0 Gb/s
Maximum Capacity of A Single HDD	1TB
Total Maximum Capacity	8TB / under RAID 0 mode
RAID Level	RAID 0 , 1 , 3 , 5 , 6 , 10 , 30 , 50 , 60 , JBOD
Hot Swappable	Yes
Auto-rebuilding	Yes
LCD Display	Yes
GUI (WEB)	Yes
LED Indicators	Yes
Buzzer	Yes
Environment Detector	Yes / Fan & Temperature
Cooling Fan	DC-12V / 4cm / 7200 rpm
Power Supply	AC 100~240V
Built-in Power Supply	DC 12V & 5V / 200W
Support O.S	Windows & Mac & Linux
Certifications	CE & FCC

3. Messages of LED Indicator

LED	Messages	Light Display
Hard Drive LED Indicators	Normal	Blue
	Failure	Red
	Access	Blue Blink
LED Indicators on the Front Panel	Power on	Blue
	Failure	Red

4. Hardware Installation

- 1) Take the tray out and install the hard disk onto the tray. Make sure the hard disk is firmly fixed to the tray with the screws to ensure no damage is caused by vibrations.



- 2) Refit the hard drive tray into the AR108X (Please note that AR108X DO NOT support SAS HDD)
- 3) Connect the SAS port, Gigabit LAN or RS-232 port and, finally, connect the power cord.
- 4) Please use **Serial Attached SCSI (SAS) Host Bus Adapters with mini SAS interface** and firmly fix it on the slot of the computer. Then please install the driver of adapter and connect AR108X to miniSAS card with SAS cable. Then the hardware installation is complete.
- 5) After the installation is complete, you can turn on the power of the computer and log into system through LAN port or RS232 port and perform related configuration and application.
(The default account/password is admin/1234. IP address is 192.168.0.1)

5. The Methods of Setting AR108X


Three setting methods are shown as follows, please choose one for setting AR108X.

1) Graphical User Interface (GUI)

Sans Digital AR108X supports GUI for system management. Please make sure that related network ports are connected. For connection through the network port, if using a fixed IP, make sure the fixed IP Address doesn't conflict with other IP Addresses. Use a "ping" to check if the IP Address conflicts with other IPs.

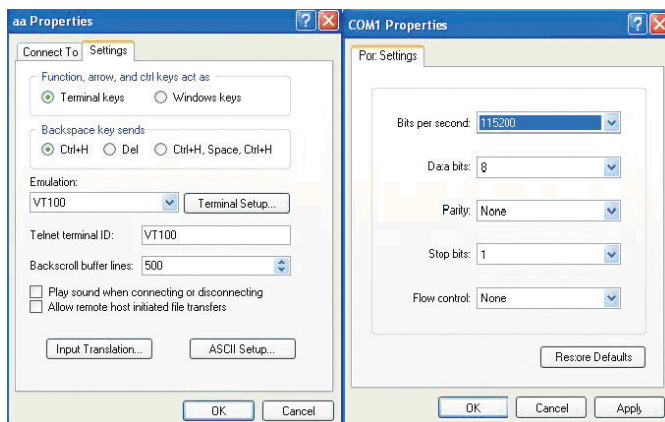
2) RAID Finder

The RAID Finder software can easily find the IP Address of AR108X installed in the network and help the process of getting on to the login screen. You can insert the disc and go to "RAID Finder" folder under "Management Software" and click "RAIDFinder.jar" to perform the installation. Complete the installation and run the software, which will automatically search for AR108X in the network and display any related information. Click and select the device IP address and the software will automatically open the browser and display the login screen. Enter the account and password to login system to configure settings (The default account/password is admin/1234).

 Notice : RAID Finder is a java application. Before started, please go to www.java.com for downloading free java runtime environment.

3) RS-232 Port

You can manage and configure the system through RS-232 directly, or if you forget the initially configured IP Address, you can use RS-232 port to enter the system for configuration. For further information, please refer to user manual.



6. After choosing the configuration method, please set RAID mode by following the following steps. Then format the hard drives with the disk management tool on the OS system.

1) You could change IP as DHCP or STATIC IP for login GUI. For further information, please refer to the user manual.

S140C / System config / IP address

Quick install
System config
System name
IP address
Language
Login config
Password
Date
Mail
SNMP
Messenger

☒ DHCP
☐ Static

Address : 10.1.2.123
Mask : 255.255.255.0
Gateway : 10.1.2.1
DNS : 168.95.1.1
MAC : 00:13:78:A4:10:63
HTTP port : 80
HTTPS port : 443
SSH port : 22

Confirm

2) Please select “Quick Install” to configure your prefer RAID mode. For further information, please refer to the user manual.

S140C / Quick install / Step1

Quick install
System config
Volume config
Enclosure management
Maintenance
Logout

RAID level : - RAID 0 (595 GB) -

Next >>

3) After configuration, you can check the related information through “Volume config / Physical disk”. For further information, please refer to the user manual.

S140C / Volume config / Physical disk

Quick install
System config
Volume config
Physical disk
Volume group
User data volume
Cache volume
Logical unit
Enclosure management
Maintenance
Logout

- Select - Free disks Global spares Dedicated spares

	Slot	WWN	Size (GB)	VG name	Status	1	2	Speed
<input type="checkbox"/>	1	206f001378a40000	465		Good	f	RD	3.0Gb/s
<input type="checkbox"/>	3	2002001378a41063	297		Good	f	RD	3.0Gb/s
<input type="checkbox"/>	4	200c001378a40174	148		Good	f	RD	3.0Gb/s

Auto spin-down : Disabled

- Select - Free disks Global spares Dedicated spares

4) After configuring RAID volume, please reboot the computer and then format hard drives with the disk management tools on the OS system.

7. The AR108X will be ready to use after setting up successfully.

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Chapter 1 RAID introduction

1.1 Features

AR108X series features:

- Front-end 1 Serial Attached SCSI 3Gbps 4 lanes wide port for SAS host connectivity.
- RAID 6, 60 ready.
- Snapshot without relying on host software. (only for specified models)
- SATA II drive backward-compatible.
- One logic volume can be shared by as many as 8 hosts.
- Host access control.
- Configurable N-way mirror for high data protection.
- On-line volume migration with no system down-time.
- HDD S.M.A.R.T. enabled for SATA drives.
- Global/dedicated cache configurable by volume.

AR108X series connects to the host system in SAS interface. It can be configured to any RAID level. The controller provides reliable data protection for servers and RAID 6. The RAID 6 allows two HDD failures without causing any impact on the existing data. Data can be recovered from the existing data and parity drives. (Data can be recovered from the rest disks/drives.)

1.2 Terminology

The document uses the following terms:

RAID	RAID is the abbreviation of “ R edundant A rray of I ndependent D isks”. There are different RAID levels with different degree of the data protection, data availability, and performance to host environment.
PD	The P hysical D isk belongs to the member disk of one specific volume group.
VG	V olume G roup. A collection of removable media. One VG consists of a set of UDV's and owns one RAID level attribute.
UDV	U ser D ata V olume. Each VG could be divided into several UDV's. The UDV's from one VG share the same RAID level, but may have different volume capacity.
CV	C ache V olume. Controller uses onboard memory as cache. All RAM (except for the part which is occupied by the controller) can be used as cache.
LUN	L ogical U nit N umber. A logical unit number (LUN) is a unique identifier which enables it to differentiate among separate devices (each one is a logical unit).
GUI	G raphic U ser I nterface.
RAID width, RAID copy, RAID row (RAID cell in one row)	RAID width, copy and row are used to describe one VG. E.g.: <ol style="list-style-type: none">1. One 4-disk RAID 0 volume: RAID width= 4; RAID copy=1; RAID row=1.2. One 3-way mirroring volume: RAID width=1; RAID copy=3; RAID row=1.3. One RAID 10 volume over 3 4-disk RAID 1 volume: RAID width=1; RAID copy=4; RAID row=3.
WT	W rite- T hrough cache-write policy. A caching technique in which the completion of a write request is not signaled until data is safely stored in non-volatile media. Each data is synchronized in both data cache and accessed physical disks.

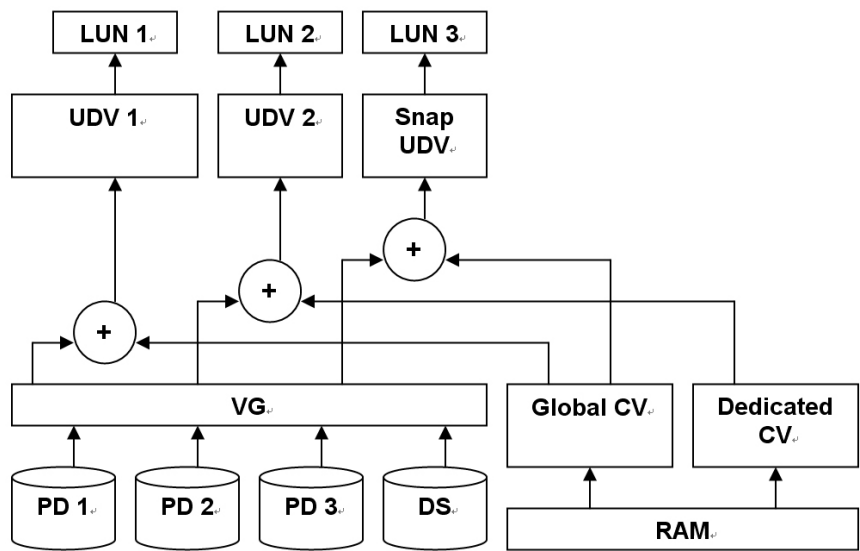
WB	Write-Back cache-write policy. A caching technique in which the completion of a write request is signaled as soon as the data is in cache and actual writing to non-volatile media occurs at a later time. It speeds up system write performance but needs to bear the risk where data may be inconsistent between data cache and the physical disks in one short time interval.
RO	Set the volume to be Read-Only .
DS	Dedicated Spare disks. The spare disks are only used by one specific VG. Others could not use these dedicated spare disks for any rebuilding purpose.
GS	Global Spare disks. GS is shared for rebuilding purpose. If some VGs need to use the global spare disks for rebuilding, they could get the spare disks out from the common spare disks pool for such requirement.
DC	Dedicated Cache .
GC	Global Cache .
DG	DeGraded mode. Not all of the array's member disks are functioning, but the array is able to respond to application read and write requests to its virtual disks.
SCSI	Small Computer Systems Interface .
SAS	Serial Attached SCSI .
iSCSI	Internet Small Computer Systems Interface .
FC	Fibre Channel
S.M.A.R.T.	Self-Monitoring Analysis and Reporting Technology .
WWN	World Wide Name .
HBA	Host Bus Adapter .
SAF-TE	SCSI Accessed Fault-Tolerant Enclosures .
SES	SCSI Enclosure Services .
NIC	Network Interface Card .
LACP	Link Aggregation Control Protocol .
MC/S	Multiple Connections per Session
MTU	Maximum Transmission Unit .
CHAP	Challenge Handshake Authentication Protocol . An optional security mechanism to control access to an iSCSI storage system over the iSCSI data ports.
iSNS	Internet Storage Name Service .

1.3 RAID levels

RAID 0	Disk striping. RAID 0 needs at least one hard drive.
RAID 1	Disk mirroring over two disks. RAID 1 needs at least two hard drives.
N-way mirror	Extension to RAID 1 level. It has N copies of the disk.
RAID 3	Striping with parity on the dedicated disk. RAID 3 needs at least three hard drives.
RAID 5	Striping with interspersed parity over the member disks. RAID 3 needs at least three hard drives.
RAID 6	2-dimensional parity protection over the member disks. RAID 6 needs at least four hard drives.
RAID 0+1	Mirroring of the member RAID 0 volumes. RAID 0+1 needs at least four hard drives.

RAID 10	Striping over the member RAID 1 volumes. RAID 10 needs at least four hard drives.
RAID 30	Striping over the member RAID 3 volumes. RAID 30 needs at least six hard drives.
RAID 50	Striping over the member RAID 5 volumes. RAID 50 needs at least six hard drives.
RAID 60	Striping over the member RAID 6 volumes. RAID 60 needs at least eight hard drives.
JBOD	The abbreviation of “ J ust a B unch O f D isks”. JBOD needs at least one hard drive.

1.4 Volume relationship diagram



This is the volume structure of **Sans Digital** designed. It describes the relationship of RAID components. One VG (Volume Group) consists of a set of UDV (User Data Volume) and owns one RAID level attribute. Each VG can be divided into several UDV. The UDV in one VG share the same RAID level, but may have different volume capacity. Each UDV will be associated with one specific CV (Cache Volume) to execute the data transaction. Each CV can have different cache memory size by user’s modification/setting. LUN (Logical Unit Number) is a unique identifier, in which users can access through SCSI commands.

Chapter 2 Getting started

2.1 Before starting

Before starting, prepare the following items.

1. Check “Certification list” in Appendix A to confirm the hardware setting is fully supported.
2. A server with a SAS HBA.
3. SAS cables.
4. CAT 5e, or CAT 6 network cables for management port.
5. Prepare storage system configuration plan.
6. Management port network information. When using static IP, please prepare static IP addresses, subnet mask, and default gateway.
7. Setup the hardware connection before power on servers and **Sans Digital** RAID Subsystem. Connect SAS cables, console cable, and management port cable in advance.

2.2 Storage introduction

For **AR108X**, Serial-attached SCSI offers advantages over older parallel technologies. The cables are thinner, and the connectors are less bulky. Serial data transfer allows the use of longer cables than parallel data transfer.

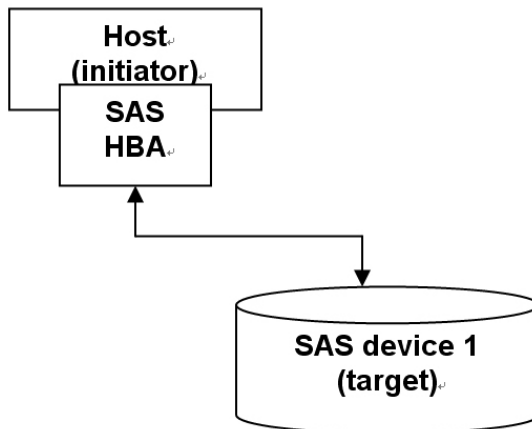


Figure 2.2.1

The target is the storage device itself or an appliance which controls and serves volumes or virtual volumes. The target is the device which performs SCSI command or bridge to an attached storage device.

2.3 Management methods

There are three management methods to manage Sans Digital AR108X SAS RAID, describe in the following:

2.3.1 Web GUI

AR108X support graphic user interface to manage the system. Be sure to connect LAN cable. The default setting of management port IP is DHCP and DHCP address displays on LCM; user can inspect LCM for IP first, then open the browser and type the DHCP address: (The DHCP address is dynamic and user may need to check every time after reboot.) When DHCP service is not available, controllers use zero configuration (Zeroconf) to get an IP address.

Take an example on LCM:

192.168.0.1
SANS DIGITAL
←

http://192.168.0.1 or **https://192.168.0.1** (https: connection with encrypted Secure Sockets Layer (SSL). Please be aware of the https is slower than http. https is supported on some specified models.)

Click any function at the first time; it will pop up a dialog to authenticate current user.

Login name: **admin**
Default password: **1234**

Or login with read-only account which only allows reading the configuration and cannot change setting.

Login name: **user**
Default password: **1234**

2.3.2 Console serial port


Use NULL modem cable to connect console port.
The console setting is baud rate: **115200**, 8 bits, 1 stop bit, and no parity.
Terminal type: **vt100**
Login name: **admin**
Default password: **1234**

2.3.3 Remote control – secure shell

SSH (secure shell) is required for controllers to remote login. The SSH client software is available at the following web site:

SSHWinClient WWW: <http://www.ssh.com/>
Putty WWW: <http://www.chiark.greenend.org.uk/>

Host name: **192.168.0.1** (Please check your DHCP address for this field.)
Login name: **admin**
Default password: **1234**

 **Tips :** **AR108X** only support SSH for remote control. For using SSH, the IP address and password are required for login.

2.4 Enclosure

2.4.1 LCD Display

There are four buttons to control **Sans Digital** LCM (LCD Control Module), including:
▲ (up), ▼ (down), **ESC** (Escape), and **ENT** (Enter).

After booting up the system, the following screen shows management port IP and model name:

```
192.168.0.1  
SANS DIGITAL  ←
```

Press “**ENT**”, the LCM functions “**Alarm Mute**”, “**Reset/Shutdown**”, “**Quick Install**”, “**View IP Setting**”, “**Change IP Config**” and “**Reset to Default**” will rotate by pressing ▲ (up) and ▼ (down).

When there is WARNING or ERROR occurred (LCM default filter), the LCM shows the event log to give users more detail from front panel.

The following table is function description.

Alarm Mute	Mute alarm when error occurs.
Reset/Shutdown	Reset or shutdown controller.
Quick Install	Quick steps to create a volume. Please refer to next chapter for operation in web UI.
View IP Setting	Display current IP address, subnet mask, and gateway.
Change IP Config	Set IP address, subnet mask, and gateway. There are 2 options: DHCP (Get IP address from DHCP server) or static IP.
Reset to Default	Reset to default will set password to default: 1234, and set IP address to default as DHCP setting. Default IP address: 192.168.10.50 (DHCP) Default subnet mask: 255.255.255.0 Default gateway: 192.168.10.254

The following is LCM menu hierarchy.

Sans Digital ▲▼	[Alarm Mute]	[▲Yes No▼]		
	[Reset/Shutdown]	[Reset]	[▲Yes No▼]	
		[Shutdown]	[▲Yes No▼]	
	[Quick Install]	RAID 0 RAID 1 RAID 3 RAID 5 RAID 6 RAID 0+1 xxx GB	[Volume Size] xxx GB	Adjust Volume Size
			[Apply The Config]	[▲Yes No▼]
	[View IP Setting]	[IP Config] [Static IP]		
		[IP Address] [192.168.010.050]		
		[IP Subnet Mask] [255.255.255.0]		
		[IP Gateway] [192.168.010.254]		
	[Change IP Config]	[DHCP]	[▲Yes No▼]	
		[Static IP]	[IP Address]	Adjust IP address
			[IP Subnet Mask]	Adjust Submask IP
			[IP Gateway]	Adjust Gateway IP
			[Apply IP Setting]	[▲Yes No▼]
	[Reset to Default]	[▲Yes No▼]		

 Notice : Before power off, it is better to execute “**Shutdown**” to flush the data from cache to physical disks.

2.4.2 System buzzer

The system buzzer features are listed below:

1. The system buzzer alarms 1 second when system boots up successfully.
2. The system buzzer alarms continuously when there is error occurred. The alarm will be stopped after error resolved or be muted.
3. The alarm will be muted automatically when the error is resolved. E.g., when RAID 5 is degraded and alarm rings immediately, user changes/adds one physical disk for rebuilding. When the rebuilding is done, the alarm will be muted automatically.

2.4.3 LED

The LED features are listed below:

1. **Marquee / Disk Status / Disk Rebuilding LED:** The Marquee / Disk Status / Disk Rebuilding LEDs are displayed in the same LEDs. The LEDs indicates different functions in different stages.

- 1). **Marquee LEDs:** When system powers on and successfully boots up, the Marquee LED is on until the system boots successful.
- 2). **Disk status LEDs:** the LEDs reflect the disk status for the tray. Only On/Off situation.
- 3). **Disk rebuilding LEDs:** the LEDs are blinking when the disks are under rebuilding.
2. **Disk Access LED:** Hardware activated LED when accessing disks (IO).
3. **Disk Power LED:** Hardware activated LED when the disks are plugged in and powered on.
4. **System status LED:** Used to reflect the system status by turning on the LED when error occurs or RAID malfunction happens.
5. **Management LAN port LED:** GREEN LED is for LAN transmit/receive indication. ORANGE LED is for LAN port 10/100 LINK indication.
6. **BUSY LED:** Hardware activated LED when the front-end channel is busy.
7. **POWER LED:** Hardware activated LED when system is powered on.

Chapter 3 Web GUI guideline

3.1 AR108X Series GUI hierarchy

The below table is the hierarchy of web GUI.

Quick Install	→	Step 1 / Step 2 / Step 3 / Confirm
System Config		
System name	→	System name
IP address	→	DHCP / Static / Address / Mask / Gateway / DNS / HTTP port / HTTPS port / SSH port
Language	→	Language
Login config	→	Auto logout / Login lock
Password	→	Old password / Password / Confirm
Date	→	Time zone / Date / Time / NTP Server
Mail	→	Mail-from address / Mail-to address / Sent events / SMTP relay / SMTP server / Authentication / Account / Password / Confirm / Send test mail
SNMP	→	SNMP trap address / Community / Send events
Messenger	→	Messenger IP/hostname / Send events
System log server	→	Server IP/hostname / Port / Facility / Event level
Event log	→	Filter / Download / Mute / Clear
Volume config		
Physical disk	→	Free disks / Global spares / Dedicated spares / More information / Auto Spindown
Volume group	→	Create / Delete / More information / Rename / Migrate
User data volume	→	Attach / Snapshot / Create / Delete / More information / Rename / Extend / Set read/write mode / Set priority / Resize Snapshot space / Auto Snapshot
Cache volume	→	Create / Delete / More information / Resize
Logical unit	→	Attach / Detach
Enclosure management		
SES Config	→	Enable / Disable
Hardware Monitor	→	Auto shutdown
S.M.A.R.T.	→	S.M.A.R.T. information(Only for SATA disks)
UPS	→	UPS Type / Shutdown Battery Level / Shutdown Delay / Shutdown UPS
Maintenance		
Upgrade	→	Browse the firmware to upgrade / Export config
Info	→	System information
SAS	→	SAS Topology
Reset to default	→	Sure to reset to factory default?
Config Import & export	→	Import/Export / Import file
Shutdown	→	Reboot / Shutdown
Logout		Sure to logout?

3.2 Login

Sans Digital AR108X SAS RAID supports graphic user interface (GUI) to operate the system. Be sure to connect the LAN cable. The default IP setting is **DHCP**; open the browser and enter:

http:// 192.168.0.1. (Please check the DHCP address first on LCM.)

Click any function at the first time; it will pop up a dialog for authentication.

Login name: **admin**
Default password: **1234**

After login, you can choose the functions which lists on the left side of window to make configuration.

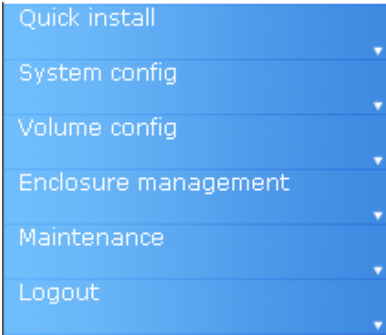








Figure 3.2.1

There are six indicators at the top-right corner for backplane solutions, and cabling solutions have three indicators at the top-right corner.



Figure 3.2.2

1.  **RAID light:** Green means RAID works well. Red represents RAID failure.
2.  **Temperature light:** Green means normal temperature. Red represents abnormal temperature.
3.  **Voltage light:** Green means normal voltage. Red represents abnormal voltage..
4.  **UPS light:** Green means UPS works well. Red represents UPS failure.
5.  **Fan light:** Green means Fan works well. Red represents fan failure.
(Only for backplane solution)
6.  **Power light:** Green means Power works well. Red represents power failure.
(Only for backplane solution)

3.3 Quick install

It is easy to use “**Quick install**” to create a volume. Depending on how many physical disks or how many residual spaces on created VGs are free, the system will calculate maximum spaces on RAID levels 0/1/3/5/6/0+1. “Quick install” will occupy all residual VG space for one UDV, and so it will have no space left for snapshots and spares. If snapshot is needed, please create volumes manually, and refer to next chapter for more detail about snapshots.

“Quick Install” has a smarter policy. When the system is inserted with some HDDs. “Quick Install” lists all possibilities and sizes in different RAID levels, and it will use all available HDD for RAID level depending on whichever the user chooses. When system has different sizes of HDDs, e.g., 8*200G and 8*80G, it lists all possibilities and combinations of different RAID levels and different sizes. After the user chooses a RAID level, users may find there are still some HDDs are available (free status). This results from using a smarter policy designed by **Sans Digital**. It gives the user:

- 1. Biggest capacity of RAID level for user to choose and,
- 2. The fewest disk number for RAID level / volume size.

E.g., user chooses RAID 5 and the controller has 12*200G + 4*80G HDDs inserted. If we use all 16 HDDs for a RAID 5, and then the maximum size of volume is 1200G (80G*15). By the wizard, we do smarter check and find out the most efficient way of using HDDs. The wizard only uses 200G HDDs (Volume size is 200G*11=2200G), the volume size is bigger and fully uses HDD capacity.

Step 1: Select “Quick install” and then choose the RAID level. After RAID level is chosen, click “Next >>”. Then it will link to next page.

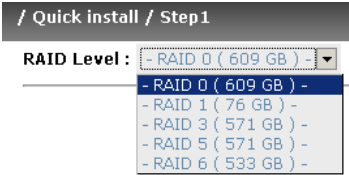


Figure 3.3.1

Step 2: Please select a LUN number. Access control of host would show as a wildcard “*”, which means every host can access to this volume. In this page, the “Volume size” can be changed. Default value is the maximum volume size. To adjust the size, be sure it is less or equal to maximum volume size. Then click “Next >>”.

Step 3: Confirm page. Click “Confirm” if all setups are correct. Then a UDV will be created.

Done. You can start to use the system now.

Attach Snapshot Create Delete

<input type="checkbox"/>	No.	Name	Size (GB)	Status	1	2	3	R %	RAID	#LUN	Snapshot (GB)	VG name	CV (MB)
<input type="checkbox"/>	1	QUICK68809	609	Online					RAID 0	1	0.00/0.00	QUICK45427	663

Attach Snapshot Create Delete

Figure 3.3.2

(Figure 3.3.2: A RAID 0 user data volume with the UDV name “QUICK68809”, named by system itself, with the total available volume size 609GB.)

3.4 System configuration

“System config” is designed for setting up the “System name”, “IP address”, “Language”, “Login config”, “Password”, “Date”, “Mail”, “SNMP”, “Messenger”, “System log server” and viewing the “Event log”.

System name	System name for identification
IP address	Internet Protocol(IP) address for remote administration
Language	Language preference for WebUI
Login config	Configuration for auto logout and login lock
Password	Administrator's password
Date	System time for event log
Mail	Alert by e-mail
SNMP	Alert via Simple Network Management Protocol(SNMP)
Messenger	Transmits net send and Alerter service messages between clients and servers
System log server	Alert to remote system log server
Event log	System event log to record critical events

Figure 3.4.1

3.4.1 System name

“System name” allows you to change the system name. Default “system name” is composed of the model name and serial number of this system, e.g.: S500C-A00001.



Figure 3.4.1.1

3.4.2 IP address

“IP address” can change IP address for remote administration usage. There are 2 options, DHCP (Get IP address from DHCP server) or static IP. The default setting is DHCP. User can change the HTTP, HTTPS, and SSH port number when the default port number is not allowed on host/server.

/ System config / IP address

☒ DHCP

☐ Static

Address :

 Mask :

 Gateway :

 DNS :

 MAC : 00:13:78:00:00:DB

 HTTP port :

 HTTPS port :

 SSH port :

Figure 3.4.2.1

3.4.3 Language

“**Language**” can set the language shown in Web UI. The option “Auto Detect” will be detected by browser for language setting.

/ System config / Language

Language :

Auto Detect

 English

 Simplified Chinese

Figure 3.4.3.1

3.4.4 Login config

“**Login config**” can set single admin and auto logout time. The single admin can prevent multiple users access the same controller at the same time.

1. Auto logout: The options are (1) Disable; (2) 5 minutes; (3) 30 minutes; (4) 1 hour. The system will log out automatically when user is inactive for a period of time.
2. Login lock: Disable/Enable. When the login lock is enabled, the system allows only one user to login or modify system settings.

/ System config / Login config

Auto logout :

 Login lock :

- Disable -

 - Enable -

Figure 3.4.4.1

3.4.5 Password

“**Password**” can change administrator password. The maximum length of admin password is 12 characters.

/ System config / Password

Old password :

Password :

Confirm :

Figure 3.4.5.1

3.4.6 Date

“**Date**” can set up the current date, time, and time zone before using or synchronize time from NTP (Network Time Protocol) server.

/ System config / Date

Now :

2007/8/1 16:16:18

Time zone :

Asia/Taipei

☒ Setup date and time manually

Date :

2007

/

8

/

1

Time :

16

:

15

:

53

☐ NTP

Server :

Figure 3.4.6.1

3.4.7 Mail

“**Mail**” can enter at most 3 mail addresses for receiving the event notification. Some mail servers would check “**Mail-from address**” and need authentication for anti-spam. Please fill the necessary fields and click “**Send test mail**” to test whether email functions are available. Users can also select which levels of event logs are needed to be sent via Mail. Default setting only enables ERROR and WARNING event logs.

/ System config / Mail

Mail-from address :

mailman@controller

Mail-to address 1 :

Send events 1 :

INFO ☐ WARNING ☒ ERROR ☒

Mail-to address 2 :

Send events 2 :

INFO ☐ WARNING ☒ ERROR ☒

Mail-to address 3 :

Send events 3 :

INFO ☐ WARNING ☒ ERROR ☒

SMTP relay :

☐

SMTP server :

Authentication :

None

Account :

Password :

Confirm :

Send test mail :

☐

Figure 3.4.7.1

3.4.8 SNMP

“SNMP” can set up SNMP trap for alerting via SNMP. It allows up to 3 SNMP trap addresses. Default community setting is “public”. User can choose the event log levels and default setting only enables INFO event log in SNMP.

/ System config / SNMP

SNMP trap address 1 :

SNMP trap address 2 :

SNMP trap address 3 :

Community :

public

Send events :

INFO ☒ WARNING ☐ ERROR ☐

Figure 3.4.8.1

There are many SNMP tools. The following web sites are for your reference:

SNMPC: <http://www.snmpc.com/>

Net-SNMP: <http://net-snmp.sourceforge.net/>

3.4.9 Messenger

To use “**Messenger**”, the user must enable the service “Messenger” in Windows (Start → Control Panel → Administrative Tools → Services → Messenger), and then event logs can be received. It allows up to 3 messenger addresses. User can choose the event log levels and default setting enables the WARNING and ERROR event logs.

/ System config / Messenger

Messenger IP/hostname 1 :

Messenger IP/hostname 2 :

Messenger IP/hostname 3 :

Send events :

INFO ☐

WARNING ☒

ERROR ☒

Figure 3.4.9.1

3.4.10 System log server

Using “**System log server**”, users can choose the facility and the event log level. The default port of syslog is 514. The default setting enables event level: INFO, WARNING and ERROR event logs.

/ System config / System log server

Server IP/hostname :

Port :

514

Facility :

Local4 ▾

Event level :

INFO ☒

WARNING ☒

ERROR ☒

Figure 3.4.10.1

There are some syslog server tools. The following web sites are for your reference:

WinSyslog: <http://www.winsyslog.com/>

Kiwi Syslog Daemon: <http://www.kiwisyslog.com/>

Most UNIX systems build in syslog daemon.

3.4.11 Event log

“**Event log**” can view the event messages. Click “**Filter**” button to choose the level of display event log. Click “**Download**” button will save the whole event log as a text file with file name “log-ModelName-SerialNumber-Date-Time.txt” (e.g., log-S500C-A00001-20070801-120000.txt). Click “**Clear**” button will clear event log. Click “**Mute**” button will stop alarm if system alerts.

Filter
Download
Mute
Clear

INFO:Wed, 08 Aug 2007 18:04:25 CST
UDV QUICK68809 has been created.

INFO:Wed, 08 Aug 2007 18:04:25 CST
VG QUICK45427 has been created.

INFO:Wed, 08 Aug 2007 18:01:17 CST
admin login from 192.168.10.121 via Web UI

Figure 3.4.11.1


For customizing your own display of event logs, there are three display methods, on Web UI/Console event log page, popup windows on Web UI, and on LCM. The default setting of these three displays is WARNING and ERROR event logs displayed on Web UI and LCM. The default setting disabled the popup function.

Show events :	INFO <input type="checkbox"/>	WARNING <input checked="" type="checkbox"/>	ERROR <input checked="" type="checkbox"/>
Pop up events :	INFO <input type="checkbox"/>	WARNING <input type="checkbox"/>	ERROR <input type="checkbox"/>
Show on LCM :	INFO <input type="checkbox"/>	WARNING <input checked="" type="checkbox"/>	ERROR <input checked="" type="checkbox"/>

<< Back
Confirm

Figure 3.4.11.2

The event log is displayed in reverse order which means the latest event log is on the first page. The event logs are actually saved in the first four hard drives; each hard drive has one copy of event log. For one controller, there are four copies of event logs to make sure users can check event log any time when there is/are failed disk(s).

 **Tips :** Please plug-in any of the first four hard drives, then event logs can be saved and displayed in next system boot up. Otherwise, the event logs would be disappeared.

3.5 Volume configuration

“Volume config” is designed for setting up the volume configurations including “Physical disk”, “Volume group”, “User data volume”, “Cache volume”, and “Logical unit”.

Physical disk	Hard disks to store data
Volume group	Sets of physical disks with RAID functions
User data volume	Slices of volume groups
Cache volume	Dedicated or global cache space for user data volume
Logical unit	Target volumes for hosts access

Figure 3.5.1

3.5.1 Physical disk

“Physical disk” to view the status of hard drives in the system. The following are operation tips:

1. Multiple selection. Select one or more checkboxes in front of the slot number. Or select the checkbox at the top left corner which will select all slots. Check again will select none.

- The list will disappear if there is no VG or only VG of RAID 0 and JBOD. Because these RAID levels cannot be set as dedicated spare disk.
- These three functions “Free disks”, “Global spares”, and “Dedicated spares” can make multiple selections.
- The instructions of the web pages (e.g.: volume config of VG, UDV, CV, LUN pages) are the same as previous steps.

- Select -
Free disks
Global spares
Dedicated spares

<input type="checkbox"/>	Slot	WWN	Size (GB)	VG name	Status	1	2	Speed
<input type="checkbox"/>	1	2071001378a8a002	74	VG-R0	Good			3.0Gb
<input type="checkbox"/>	2	207c001378a8a002	74	VG-R0	Good			3.0Gb
<input type="checkbox"/>	3	207b001378a8a002	74	VG-R0	Good			3.0Gb
<input type="checkbox"/>	4	207a001378a8a002	74	VG-R0	Good			3.0Gb
<input type="checkbox"/>	5	2079001378a8a002	74		Good			3.0Gb
<input type="checkbox"/>	6	207d001378a8a002	74	VG-R6	Good			3.0Gb
<input type="checkbox"/>	7	206f001378a8a002	74	VG-R6	Good			3.0Gb
<input type="checkbox"/>	8	2070001378a8a002	74	VG-R6	Good			3.0Gb
<input type="checkbox"/>	9	2078001378a8a002	74	VG-R6	Good			3.0Gb
<input type="checkbox"/>	10	2072001378a8a002	74		Good			3.0Gb
<input type="checkbox"/>	11	2073001378a8a002	74	VG-R6	Good			3.0Gb
<input type="checkbox"/>	12	2074001378a8a002	74		Good			3.0Gb
<input type="checkbox"/>	13	2075001378a8a002	74		Good			3.0Gb
<input type="checkbox"/>	14	2076001378a8a002	74		Good			3.0Gb
<input type="checkbox"/>	15	2077001378a8a002	74		Good			3.0Gb
<input type="checkbox"/>	16	20f5001378a8a002	74		Good			3.0Gb

Auto spindown : [Disabled](#)

- Select -
Free disks
Global spares
Dedicated spares

Figure 3.5.1.1

(Figure 3.5.1.1: Physical disks of slot 1,2,3,4 are created for a VG named “VG-R0”. Physical disks of slot 6,7,8,9 are created for a VG named “VG-R6”. Slot 11 is set as dedicated spare disk of VG named “VG-R6”. The others are free disks.)

• PD column description:

Slot	The position of hard drives. The number of slot begins from left to right at the front side. The button next to the number of slot is "More Information" . It shows the details of the hard drive.
WWN	World Wide Name .
Size (GB)	Capacity of hard drive.
VG Name	Related volume group name.
Status	The status of hard drive. "GOOD" → the hard drive is good. "DEFECT" → the hard drive has the bad blocks. "FAIL" → the hard drive cannot work in the respective volume.
Status 1	"RD" → RAID Disk . This hard drive has been set to RAID. "FR" → FR ee disk. This hard drive is free for use. "DS" → D edicated S pare. This hard drive has been set to the dedicated spare of the VG. "GS" → G lobal S pare. This hard drive has been set to a global spare of all VGs. "RS" → R e S erve. The hard drive contains the VG information but cannot be used. It may be caused by an uncompleted VG set, or hot-plug of this disk in the running time. In order to protect the data in the disk, the status changes to reserve. It can be reused after setting it to "FR" manually.
Status 2	"R" → R ebuild. The hard drive is doing rebuilding. "M" → M igration. The hard drive is doing migration.
Speed	3.0G → From SATA ATAPIO standard, if the disk can support ATAPIO IDENTIFY PACKET DEVICE command, and the speed can achieve Serial ATA Gen-2 signaling speed (3.0Gbps). 1.5G → From SATA ATAPIO standard, if the disk can support ATAPIO IDENTIFY PACKET DEVICE command, and the speed can achieve Serial ATA Gen-1 signaling speed (1.5Gbps). Unknown → The disk doesn't support above command, so the speed is defined as unknown.

• PD operations description:

Free disks	Make the selected hard drive to be free for use.
Global spares	Set the selected hard drive(s) to global spare of all VGs.
Dedicated spares	Set hard drive(s) to dedicated spare of selected VGs.

In this page, Sans Digital SAS RAID also provides HDD auto spindown down to save power. The default setting is disabled. User can set up in physical disk page, too.

Auto spindown : [Disabled](#)

- Select - ▼

Free disks ●

Global spares ●

Dedicated spares ●

Figure 3.5.1.2

Auto spindown :

Disabled ▾

Disabled
 30 sec
 1 min
 5 min
 30 min

Figure 3.5.1.3

3.5.2 Volume group

“Volume group” can view the status of each volume group.

• VG column description:

Create

Delete

<input type="checkbox"/>	No.	Name	Total (GB)	Free (GB)	#PD	#UDV	Status	1	2	3	RAID
<input type="checkbox"/>	1	VG-R0	297	267	4	1	Online				RAID 0
<input type="checkbox"/>	2	VG-R6	148	128	4	1	Online				RAID 6

Create

Delete

Figure 3.5.2.1

(Figure 3.5.2.1: There is a RAID 0 with 4 physical disks, named “VG-R0”, total size is 297GB, free size is 267GB, related to 1 UDV. Another is a RAID 6 with 4 physical disks, named “VG-R6”.)

No.	Number of volume group. The button next to the No. is “More Information” indication. It shows the details of the volume group.
Name	Volume group name. The button next to the Name is “Rename”.
Total(GB)	Total capacity of this volume group.
Free(GB)	Free capacity of this volume group.
#PD	The number of physical disks in volume group.
#UDV	The number of user data volumes in volume group.
Status	The status of volume group. “Online” → volume group is online. “Fail” → volume group is fail.
Status 1	“DG” → DeGraded mode. This volume group is not completed. The reason could be lack of one disk or disk failure.
Status 2	“R” → Rebuild. This volume group is doing rebuilding.
Status 3	“M” → Migration. This volume group is doing migration.

RAID	The RAID level of the volume group. The button next to the RAID level is “ Migrate ”. Click “ Migrate ” can add disk(s) to do expansion or change the RAID level of the Volume group.
-------------	---

• VG operations description:

Create	Create a volume group
Delete	Delete a volume group

3.5.3 User data volume

“User data volume” can view the status of each user data volume.

<div>Attach</div> <div>Snapshot</div> <div>Create</div> <div>Delete</div>													
<input type="checkbox"/>	No.	Name	Size (GB)	Status	1	2	3	R %	RAID	#LUN	Snapshot (GB)	VG name	CV (MB)
<input type="checkbox"/>	1	UDV-01	30	Online	WB	HI			RAID 0	1	9.99/10.00	VG-R0	663
<input type="checkbox"/>	2	UDV-02	20	Online	WB	HI	I	46%	RAID 6	1	10.00/10.00	VG-R6	663
<div>Attach</div> <div>Snapshot</div> <div>Create</div> <div>Delete</div>													

Figure 3.5.3.1

(Figure 3.5.3.1: Create a UDV named “UDV-01”, related to “VG-R0”, size is 30GB, status is online, write back, high priority, related to 1 LUN, with cache volume 663MB, 10GB snapshot (QSnap) space. The other UDV is named “UDV-02”, initializing to 46%.)

• UDV column description:

No.	Total capacity of user data volume. The button below to the size is “ Extend ”.
Name	Name of this user data volume. The button below the UDV Name is “ Rename ”.
Size(GB)	Total capacity of user data volume. The button below to the size is “ Extend ”.
Status	The status of user data volume. “ Online ” → user data volume is online. “ Fail ” → user data volume is failed.
Status 1	“ WT ” → Write Through. “ WB ” → Write Back. “ RO ” → Read Only. The button below to the status1 is “ Set read/write mode ”.
Status 2	“ HI ” → High priority. “ MD ” → MiD priority. “ LO ” → Low priority. The button in below to the status2 is “ Set Priority ”.
Status 3	“ I ” → user data volume is being initialized. “ R ” → user data volume is being rebuilt.
RAID	The levels of RAID that user data volume is using.

#LUN	Number of LUN(s) that user data volume is attaching.
Snapshot (GB)	The user data volume size that used for snapshot. The button next to the snapshot is “ Resize ” which decide the size of snapshot. The button next to resize is “ Auto snapshot ” which setups the frequency of taking snapshots. The number means “ Free snapshot space ” / “ Total snapshot space ”. If the snapshot UDV has been created, this column will be the creation time.
VG name	The VG name of the user data volume.
CV (MB)	The cache volume of the user data volume.

• UDV operations description:

Attach	Attach to a LUN.
Snapshot	Choose a UDV to execute snapshot.
Create	Create a user data volume.
Delete	Delete a user data volume.

3.5.4 Cache volume

“**Cache volume**” can view the status of cache volume.

The global cache volume is a default cache volume which is created after power on automatically, and cannot be deleted. The size of global cache is based on the RAM size. It is total memory size minus the system usage.

• CV operations description:



Create	Create a cache volume.
Delete	Delete a cache volume.

If there is no free space for creating a new dedicated cache volume, cut down the global cache size first. After resized, then the dedicated cache volume can be created.

 **Tips** : The minimum size of global cache volume is **40MB**. The minimum size of dedicated cache volume is **20MB**.

3.5.5 Logical unit number

“**Logical unit**” can view the status of attached logical unit number of each UDV.

User can attach LUN by clicking the “  ”. “Host” must enter a SAS address for access control, or fill-in wildcard “*”, which means every host can access the volume. Choose LUN number and permission, then click “  ”.

UDV :

UDV-01 (30GB)

Host :

*

LUN :

- 0 -

Permission :

☐ Read-only
☒ Read-write

<< Back

Confirm

Figure 3.5.5.1

Attach

Detach

<input type="checkbox"/>	Host	LUN	Permission	UDV name	#Session
<input type="checkbox"/>	*	0	Read write	UDV-01	2
<input type="checkbox"/>	500605B000482220	1	Read write	UDV-01	1

Attach

Detach

Figure 3.5.5.2

(Figure 3.5.4.2: LUN status for AR108X has one SAS channel.)

• LUN operations description:

Attach	Attach a logical unit number to a user data volume.
Delete	Detach a logical unit number from a user data volume.

The matching rules of access control are inspected from top to bottom in sequence. For example: there are 2 rules for the same UDV, one is “*”, LUN 0; the other is “SAS address1”, LUN 1. The other host “SAS address2” can login successfully because it matches the rule 1.

The access will be denied when there is no matching rule.

3.5.6 Examples

The followings are examples for creating volumes. Example 1 is to create two UDV’s sharing the same CV (global cache volume) and set a global spare disk. Example 2 is to create two UDV’s. One shares the global cache volume, and the other uses dedicated cache volume. Set a dedicated spare disk.

• Example 1

Example 1 is to create two UDV’s in one VG, each UDV uses global cache volume. Global cache volume is created after system boots up automatically. So, no action is needed to set CV. Then set a global spare disk. Eventually, delete all of them.

Step 1: Create VG (Volume Group).

To create the volume group, please follow the procedures:

Name :

RAID Level :

RAID PD slot :

Figure 3.5.6.1

1. Select “/ Volume config / Volume group”.
2. Click “”.
3. Enter a VG Name, choose a RAID level from the list, click “” to choose the RAID PD slot(s), then click “”.
4. Check the outcome. Click “” if all setups are correct.
5. Done. A VG has been created.

<input type="checkbox"/>	No.	Name	Total (GB)	Free (GB)	#PD	#UDV	Status	1	2	3	RAID
<input type="checkbox"/>	1	VG-5	114	114	4	0	Online				RAID 5

Figure 3.5.6.2

(Figure 3.5.6.2: Creating a RAID 5 with 4 physical disks, named “VG-R5”. The total size is 114GB. Because there is no related UDV, free size still remains 114GB.)

Step 2: Create UDV (User Data Volume).

To create a user data volume, please follow the procedures.

Name :

VG name :

CV No. :

Capacity (GB) :



Stripe height (KB) :

Block size (B) :

Read/Write : ☐ Write-through cache ☒ Write-back cache

Priority : ☒ High priority ☐ Middle priority ☐ Low priority

Figure 3.5.6.3

1. Select “/ Volume config / User data volume”.
2. Click “  ”.
3. Enter a UDV name, choose a VG Name and enter a size of UDV; decide the stripe high, block size, read/write mode and set priority, then click “  ”.
4. Done. A UDV has been created.
5. Do one more time to create another UDV.

















<div>     </div>												
<input type="checkbox"/>	No.	Name	Size (GB)	Status	1	2	3	R %	RAID	#LUN	Snapshot (GB)	VG name CV (MB)
<input type="checkbox"/>	1	UDV-R5-1	50	Online	 WB	 HI	 I	4%	RAID 5	0	0.00/0.00	VG-5 120
<input type="checkbox"/>	2	UDV-R5-2	64	Online	 WB	 HI	 I	0%	RAID 5	0	0.00/0.00	VG-5 120
<div>     </div>												

Figure 3.5.6.4

(Figure 3.5.6.4: Create UDVs named “UDV-R5-1” and “UDV-R5-2”. Regarding to “VG-R5”, the size of “UDV-R5-1” is 50GB, the size of “UDV-R5-2” is 64GB. The status of these UDVs are online, write back, high priority with cache volume 120MB. “UDV-R5-1” is initialing about 4%. There is no LUN attached.)

Step 3: Attach LUN to UDV.

There are 2 methods to attach LUN to UDV.


1. In “/ Volume config / User data volume”, press “  ”.
2. In “/ Volume config / Logical unit”, press “  ”.



The procedures are as follows:



UDV :	
Host :	
LUN :	
Permission :	<input type="radio"/> Read-only <input checked="" type="radio"/> Read-write




Figure 3.5.6.5

1. Select a UDV.
2. Enter “Host” name, which is an initiator node name for access control, or fill-in wildcard “*”, which means every host can access to this volume. Choose LUN and permission, then click “  ”.
3. Done.

Attach 
Detach 

<input type="checkbox"/>	Host	LUN	Permission	UDV name	#Session
<input type="checkbox"/>	*	0	Read write	UDV-R5-1	2 
<input type="checkbox"/>	500605B000482220	1	Read write	UDV-R5-2	1 




Attach 
Detach 


Figure 3.5.6.6





(Figure 3.5.6.6: UDV-R5-1 is attached to LUN 0. UDV-R5-2 is attached LUN 1.)

 **Tips :** The matching rules of access control are from top to bottom in sequence.

Step 4: Set global spare disk.

To set global spare disks, please follow the procedures.

1. Select “/ Volume config / Physical disk”.
2. Select the free disk(s) by clicking the checkbox in the row, then click “  ” to set as global spares.
3. “GS” icon is shown in status 1 column.

 Select
Free disks 
Global spares 
Dedicated spares 

























<input type="checkbox"/>	Slot	WWN	Size (GB)	VG name	Status	1	2	Speed
<input type="checkbox"/>	1 	2007001378a40040	38	VG-R5	Good 	 RD		1.5Gb
<input type="checkbox"/>	2 	2017001378a202d9	38	VG-R5	Good 	 RD		1.5Gb
<input type="checkbox"/>	3 	2018001378a202d9	38	VG-R5	Good 	 RD		1.5Gb
<input type="checkbox"/>	4 	2019001378a202d9	38	VG-R5	Good 	 RD		1.5Gb
<input type="checkbox"/>	5 	201a001378a202d9	38		Good 	 GS		1.5Gb
<input type="checkbox"/>	6 	20c4001378000108	38		Good 	 FR		1.5Gb
<input type="checkbox"/>	7 	201c001378a202d9	38		Good 	 FR		1.5Gb
<input type="checkbox"/>	8 	201b001378a202d9	38		Good 	 FR		1.5Gb

Figure 3.5.6.7

(Figure 3.5.6.7: Slot 5 is set as global spare disk.)

Step 5: Done. They can be used as SCSI disks.

Delete UDV's, VG, please follow the steps listed below.

Step 6: Detach LUN from UDV.

In “/ Volume config / Logical unit”

Attach

Detach

<input checked="" type="checkbox"/>	Host	LUN	Permission	UDV name	#Session
<input checked="" type="checkbox"/>	*	0	Read write	UDV-R5-1	2
<input checked="" type="checkbox"/>	500605B000482220	1	Read write	UDV-R5-2	1

Attach

Detach

Figure 3.5.6.8

1. Select LUNs by clicking the checkbox in the row, and then click “

Detach

 ”. There will pop up a confirmation page.
2. Choose “OK”.
3. Done.


Step 7: Delete UDV (User Data Volume).

To delete the user data volume, please follow the procedures:

1. Select “/ Volume config / User data volume”.
2. Select UDV's by clicking the checkbox in the row.
3. Click “

Delete

 ”. There will pop up a confirmation page.
4. Choose “OK”.
5. Done. The UDV's are deleted.

 **Tips :** When deleting UDV, the attached LUN(s) related to this UDV will be detached automatically.

Step 8: Delete VG (Volume Group).


To delete the volume group, please follow the procedures:

1. Select “/ Volume config / Volume group”.
2. Select a VG by clicking the checkbox in the row, make sure there is no UDV on this VG, otherwise the UDV(s) on this VG must be deleted first.

3. Click “  “. There will pop up a confirmation page.

4. Choose “OK”


5. Done. The VG is deleted.

 **Tips :** The action of deleting one VG will succeed only when all of the related UDV(s) are deleted in this VG. Otherwise, it will encounter an error when deleting the VG.

Step 9: Free global spare disk.

To free global spare disks, please follow the procedures.

1. Select “/ **Volume config / Physical disk**”.

2. Select the global spare disk by clicking the checkbox in the row, then click “  ” to free disk.

Step 10: Done, all volumes have been deleted.

• **Example 2**

Example 2 is to create two UDV's in one VG. One UDV shares global cache volume, the other uses dedicated cache volume. First, dedicated cache volume should be created; it can be used in creating UDV. Eventually, delete them.

Each UDV is associated with one specific CV (cache volume) to execute the data transaction. Each CV could have different cache memory size. If there is no special request in UDV's, it uses global cache volume. Or user can create a dedicated cache for individual UDV manually. Using dedicated cache volume, the performance would not be affected by other UDV's data access.

The total cache size depends on the RAM size and then set all cache size as global cache automatically. To create a dedicated cache volume, first step is to cut down global cache size for the dedicated cache volume. Please follow the procedures.

Step 1: Create dedicated cache volume.

Create

Delete

<input type="checkbox"/>	No.	Size	UDV name
<input type="checkbox"/>	1	40	Global
<input type="checkbox"/>	2	20	(Empty)



Free : 603 (MB)

Create


Delete

Figure 3.5.6.9

1. Select “/ **Volume config / Cache volume**”.

2. If there is no free space for creating a new dedicated cache volume. Firstly, decrease the global cache size by clicking the button “  ” in size column. After resizing, click “  ” to return to the cache volume page.

3. Click “  ” to enter the setup page.

4. Fill in the size and click “  ”.

5. Done. A new dedicated cache volume has been set.





 **Tips** : The minimum size of global cache volume is **40MB**. The minimum size of dedicated cache volume is **20MB**.

Step 2: Create VG (Volume Group).

Please refer to Step 1 of Example 1 to create VG.

Step 3: Create UDV (User Data Volume).

Please refer to Step 2 of Example 1 to create UDV. To create a UDV with dedicated cache volume, please follow the below procedures.

Name :	UDV-R5-2
VG name :	VG-5 
CV No. :	Dedicated (20 MB) 
Capacity (GB) :	64
Stripe height (KB) :	64 
Block size (B) :	512 
Read/Write :	<input type="radio"/> Write-through cache <input checked="" type="radio"/> Write-back cache
Priority :	<input checked="" type="radio"/> High priority <input type="radio"/> Middle priority <input type="radio"/> Low priority




 

Figure 3.5.6.10

1. Select “/ **Volume config / User data volume**”.

2. Click “  ”.

3. Enter a UDV name, choose a VG Name, and select “**Dedicated**” cache which is created at Step 1. Enter the size of UDV; decide the stripe height, block size, read/write mode and set priority, then click “  ”.

4. Done. A UDV using dedicated cache has been created.

Attach

Snapshot

Create

Delete

<input type="checkbox"/>	No.	Name	Size (GB)	Status	1	2	3	R %	RAID	#LUN	Snapshot (GB)	VG name	CV (MB)
<input type="checkbox"/>	1	UDV-R5-1	50	Online					RAID 5	1	0.00/0.00	VG-5	40
<input type="checkbox"/>	2	UDV-R5-2	64	Online				5%	RAID 5	0	0.00/0.00	VG-5	20

Attach

Snapshot

Create

Delete

Figure 3.5.6.11

(Figure 3.5.6.11: UDV named “UDV-R5-1” uses global cache volume 40MB, and “UDV-R5-2” uses dedicated cache volume 20MB. “UDV-R5-2” is initialing about 5%.)

Create		Delete	
<input type="checkbox"/>	No.	Size	UDV name
<input type="checkbox"/>	1	40	Global
<input type="checkbox"/>	2	20	UDV-R5-2

Free : 603 (MB)

Figure 3.5.6.12

(Figure 3.5.6.12: In “/ Volume config / Cache volume”, UDV named “UDV-R5-2” uses dedicated cache volume 20MB.)

Step 4: Attach LUN to UDV.

Please refer to Step 3 of Example 1 to attach LUN.

Step 5: Set dedicated spare disk.

To set dedicated spare disks, please follow the procedures:

1. Select “/ Volume config / Physical disk”.
2. Select a VG from the list, then select the free disk(s). Click “ ” to set the dedicated spare for the VG.
3. The “**DS**” icon is shown in the column of status 1.

- Select -

Free disks

Global spares

Dedicated spares

<input type="checkbox"/>	Slot	WWN	Size (GB)	VG name	Status	1	2	Speed
<input type="checkbox"/>	1	2007001378a40040	38	VG-R5	Good	RD		1.5Gb
<input type="checkbox"/>	2	2017001378a202d9	38	VG-R5	Good	RD		1.5Gb
<input type="checkbox"/>	3	2018001378a202d9	38	VG-R5	Good	RD		1.5Gb
<input type="checkbox"/>	4	2019001378a202d9	38	VG-R5	Good	RD		1.5Gb
<input type="checkbox"/>	5	201a001378a202d9	38	VG-R5	Good	DS		1.5Gb
<input type="checkbox"/>	6	20c4001378000108	38		Good	FR		1.5Gb
<input type="checkbox"/>	7	201c001378a202d9	38		Good	FR		1.5Gb
<input type="checkbox"/>	8	201b001378a202d9	38		Good	FR		1.5Gb

Figure 3.5.6.13

(Figure 3.5.7.13: Slot 5 has been set as dedicated spare disk of VG named “VG-R5”.)

Step 6: Done. The PDs can be used as SCSI disks.

Delete UDV and VG, please follow the steps.

Step 7: Detach LUN from UDV.

Please refer to Step 6 of Example 1 to detach LUN.

Step 8: Delete UDV (User Data Volume).

Please refer to Step 7 of Example 1 to delete UDV.

Step 9: Delete VG (User Data Volume).

Please refer to Step 8 of Example 1 to delete VG.


Step 10: Free dedicated spare disk.


To free dedicated spare disks, please follow the procedures:

1. Select “/ Volume config / Physical disk”.
2. Select the dedicated spare disk by clicking the checkbox in the row, then click “Free disks” to free disk.

Step 11: Delete dedicated cache volume.

To delete the cache volume, please follow the procedures:

1. Select “/ **Volume config / Cache volume**”.
2. Select a CV by clicking the checkbox in the row.
3. Click “  “. There will pop up a confirmation page.
4. Choose “OK”.
5. Done. The CV has been deleted.

 Notice : Global cache volume cannot be deleted.

Step 12: Done, all volumes have been deleted.

3.6 Enclosure management

“**Enclosure management**” allows managing enclosure information including “**SES config**”, “**Hardware monitor**”, “**S.M.A.R.T.**” and “**UPS**”. For the enclosure management, there are many sensors for different purposes, such as temperature sensors, voltage sensors, hard disks, fan sensors, power sensors, and LED status. Due to the different hardware characteristics among these sensors, they have different polling intervals. Below is the detail polling time intervals:

1. Temperature sensors: 1 minute.
2. Voltage sensors: 1 minute.
3. Hard disk sensors: 10 minutes.
4. Fan sensors: 10 seconds . When there are 3 errors consecutively, controller sends ERROR event log.
5. Power sensors: 10 seconds, when there are 3 errors consecutively, controller sends ERROR event log.
6. LED status: 10 seconds.

<u>SES config</u>	Access control for SES management
<u>Hardware monitor</u>	System monitored voltage, temperature and battery backup module
<u>S.M.A.R.T.</u>	Self-monitoring analysis and reporting technology for physical disks
<u>UPS</u>	Uninterruptible power supply

Figure 3.6.1

3.6.1 SES configuration

SES represents **SCSI Enclosure Services**, one of the enclosure management standards. “**SES config**” can enable or disable the management of SES.

<input type="checkbox"/>	Host	LUN	Permission	UDV name
<input type="checkbox"/>	*	0	Read write	(SES)

Figure 3.6.1.1

(Figure 3.6.1.1: Enable SES in LUN 0, and can be accessed from every host)

The SES client software is available at the following web site:

SANTools: <http://www.santools.com/>

3.6.2 Hardware monitor

“Hardware monitor” can view the information of current voltage and temperature.

/ Enclosure management / Hardware monitor	
Item	Information
+1.5V:	+1.52 V (min = +1.44 V, max = +1.63 V)
+3.3V:	+3.28 V (min = +3.10 V, max = +3.55 V)
+5V:	+5.02 V (min = +4.80 V, max = +5.35 V)
+12V:	+12.08 V (min = +11.40 V, max = +12.80 V)
+2.5V:	+2.54 V (min = +2.45 V, max = +2.75 V)
PSU +5V(Backplane):	+5.10 V (min = +4.70 V, max = +5.35 V)
PSU +12V(Backplane):	+12.23 V (min = +11.40 V, max = +12.80 V)
PSU +3.3V(Backplane):	+3.31 V (min = +3.10 V, max = +3.55 V)
Daughter Board:	+43.0 (C) (hyst = +0.0 (C), high = +70.0 (C))
PCI-X BRG:	+33.5 (C) (hyst = +0.0 (C), high = +60.0 (C))
Core Processor:	+46.0 (C) (hyst = +0.0 (C), high = +75.0 (C))
Location 1(Backplane):	+29.0 (C) (hyst = +0.0 (C), high = +45.0 (C))
Location 2(Backplane):	+29.0 (C) (hyst = +0.0 (C), high = +45.0 (C))
Location 3(Backplane):	+29.5 (C) (hyst = +0.0 (C), high = +45.0 (C))
PSU1 (Backplane):	good
PSU2 (Backplane):	good
FAN1(Backplane):	good
FAN2(Backplane):	good
FAN3(Backplane):	good

Auto shutdown : ☒

Figure 3.6.2.1

If “**Auto shutdown**” has been checked, the system will shutdown automatically when voltage or temperature is out of the normal range. For better data protection, please check “**Auto Shutdown**”.

For better protection and avoiding single short periods of high temperature triggering auto shutdown, controllers use multiple condition judgments for auto shutdown, below are the details of when the Auto shutdown will be triggered.

- 1. There are 3 sensors placed on controllers for temperature checking, they are on core processor, PCI-X bridge, and daughter board. controller will check each sensor for every 30 seconds. When one of these sensor is over high temperature value for continuous 3 minutes, auto shutdown will be triggered immediately.
- 2. The core processor temperature limit is 85°C. The PCI-X bridge temperature limit is 80°C. The daughter board temperature limit is 80°C.
- 3. If the high temperature situation doesn't last for 3 minutes, controller will not do auto shutdown.

3.6.3 Hard drive S.M.A.R.T. support

S.M.A.R.T. (**S**elf-**M**onitoring **A**nalysis and **R**eporting **T**echnology) is a diagnostic tool for hard drives to deliver warning of drive failures in advance. S.M.A.R.T. provides users chances to take actions before possible drive failure.

S.M.A.R.T. measures many attributes of the hard drive all the time and inspects the properties of hard drives which are close to be out of tolerance. The advanced notice of possible hard drive failure can allow users to back up hard drive or replace the hard drive. This is much better than hard drive crash when it is writing data or rebuilding a failed hard drive.

“**S.M.A.R.T.**” can display S.M.A.R.T. information of hard drives. The number is the current value; the number in parenthesis is the threshold value. The threshold values of hard drive vendors are different; please refer to vendors’ specification for details.

S.M.A.R.T. only supports SATA drive. SAS drive does not have. It will show N/A in this web page.

/ Enclosure management / S.M.A.R.T.

Slot	Read error rate	Spin up time	Reallocated sector count	Seek error rate	Spin up retries	Calibration retries	Temperature (C)	Status
1		203(63)	253(63)	253(0)	253(157)	253(223)	41	Good
2	100(16)	107(24)	100(5)	100(67)	100(60)		31	Good
3	100(16)	104(24)	100(5)	100(67)	100(60)		32	Good
4	70(6)	96(0)	100(36)	75(30)	100(97)		31	Good
5	100(16)	102(24)	100(5)	100(67)	100(60)		32	Good
6		203(63)	253(63)	253(0)	253(157)	253(223)	28	Good
7	94(16)	99(24)	100(5)	100(67)	100(60)		31	Good
8	200(51)	171(21)	200(140)	200(51)	100(51)	100(51)	30	Good

Figure 3.6.3.1

3.6.4 UPS

“**UPS**” can set up UPS (**U**ninterruptible **P**ower **S**upply).

UPS Type :

None

Shutdown Battery Level (%) :

5

Shutdown Delay (s) :

0

Shutdown UPS :

OFF

Status :

Battery Level (%) :

Confirm

Figure 3.6.4.1

Currently, the system only supports and communicates with smart-UPS of APC (American Power Conversion Corp.) UPS. Please review the details from the website: <http://www.apc.com/>.

First, connect the system and APC UPS via RS-232 for communication. Then set up the shutdown values when power is failed. UPS in other companies can work well, but they have no such communication feature.

UPS Type	Select UPS Type. Choose Smart-UPS for APC, None for other vendors or no UPS.
Shutdown Battery Level (%)	When below the setting level, system will shutdown. Setting level to “0” will disable UPS.
Shutdown Delay (s)	If power failure occurred, and system can not return to value setting status, the system will shutdown. Setting delay to “0” will disable the function.
Shutdown UPS	Select ON, when power is gone, UPS will shutdown by itself after the system shutdown successfully. After power comes back, UPS will start working and notify system to boot up. OFF will not.
Status	The status of UPS. “Detecting...” “Running” “Unable to detect UPS” “Communication lost” “UPS reboot in progress” “UPS shutdown in progress” “Batteries failed. Please change them NOW!”
Battery Level (%)	Current percentage of battery level.

3.7 System maintenance

“Maintenance” allows operation of the system functions including “Upgrade” to the latest firmware, “Info” to show the system version, “Reset to default” to reset all controller configuration values to factory settings, “Config import & export” to import and export all controller configuration except VG/UDV setting and LUN setting, and “Shutdown” to either reboot or shutdown the system.

Upgrade	Remote upload firmware
Info	System information
SAS	SAS topology
Reset to default	Reset to factory default
Config import & export	Import/export configurations
Shutdown	Reboot or shutdown system

Figure 3.7.1

3.7.1 Upgrade

“**Upgrade**” can upgrade firmware. Please prepare new firmware file named “**xxxx.bin**” in local hard drive, then click “ ” to select the file. Click “ ”, it will pop up a message “Upgrade system now? If you want to downgrade to the previous FW later (not recommend), please export your system configuration in advance”, click “**Cancel**” to export system configuration in advance, then click “**OK**” to start to upgrade firmware.

Browse the firmware to upgrade :

[Export config](#)

Figure 3.7.1.1

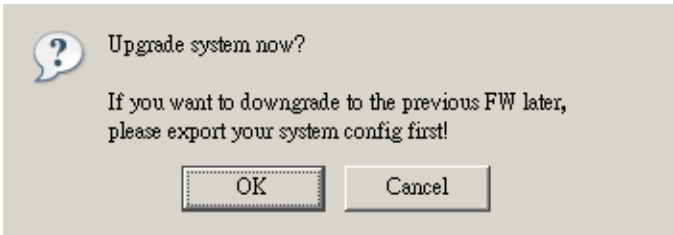


Figure 3.7.1.2

When upgrading, there is a progress bar running. After finished upgrading, the system must reboot manually to make the new firmware took effect.

 **Tips :** Please contact with tech@sansdigital.com for latest firmware.

3.7.2 Info

“**Info**” can display system information (including firmware version), CPU type, installed system memory, and controller serial number.

3.7.3 SAS

“SAS” can display SAS addresses.

No.	Device	SAS address
1	SAS Initiator	500605B000482224

Figure 3.7.3.1

3.7.4 Reset to default

“Reset to default” allows user to reset controller to the factory default setting.

Sure to reset to factory default?

Confirm

Figure 3.7.4.1


Reset to default value, the password is: 1234, and IP address as below.
Default IP address: 192.168.0.1
Default subnet mask: 255.255.255.0
Default gateway: 192.168.10.254

3.7.5 Config import & export

“Config import & export” allows user to save system configuration values: export, and apply all configuration: import. For the volume configuration setting, the values are available in export and not available in import which can avoid conflict/date-deleting between two controllers. That says if one controller already exists valuable data in the disks and user may forget to overwrite it. Use import could return to original configuration. If the volume setting was also imported, user’s current data will be overwritten.

Import/Export :
Import file :
Import
Import Logical unit only
Export
Browse...
Confirm

Figure 3.7.5.1

- 1. **Import:** Import all system configurations excluding volume config.
 - 2. **Import Logical unit only:** No system and volume configurations, import LUN configurations only.
 - 3. **Export:** Export all configurations to a file.
-  Notice : “Import” will import all system configurations excluding volume configuration; the current configurations will be replaced.

3.7.6 Shutdown

“**Shutdown**” displays “**Reboot**” and “**Shutdown**” buttons. Before power off, it's better to execute “**Shutdown**” to flush the data from cache to physical disks. The step is necessary for data protection.



Figure 3.7.6.1

3.8 Logout

For security reason, “**Logout**” allows users logout when no user is operating the system. Re-login the system; please enter username and password again.

Chapter 4 Advanced operation

4.1 Rebuild

If one physical disk of the VG which is set as protected RAID level (e.g.: RAID 3, RAID 5, or RAID 6) is FAILED or has been unplugged/removed, then the status of VG is changed to degraded mode, the system will search/detect spare disk to rebuild the degraded VG to a complete one. It will detect dedicated spare disk as rebuild disk first, then global spare disk.

Sans Digital AR108X SAS RAID supports Auto-Rebuild. The following is the scenario:

Take RAID 6 for example:


1. When there is no global spare disk or dedicated spare disk in the system, controller will be in degraded mode and wait until (A) there is one disk assigned as spare disk, or (B) the failed disk is removed and replaced with new clean disk, then the Auto-Rebuild starts. The new disk will be a spare disk to the original VG automatically.

If the new added disk is not clean (with other VG information), it would be marked as RS (reserved) and the system will not start "auto-rebuild".

If this disk is not belonging to any existing VG, it would be FR (Free) disk and the system will start Auto-Rebuild.

If user only removes the failed disk and plugs the same failed disk in the same slot again, the auto-rebuild will start running. Rebuilding in the same failed disk may impact customer data if the status of disk is unstable. Sans Digital suggests all customers not to rebuild in the same failed disk.

2. When there is enough global spare disk(s) or dedicated spare disk(s) for the degraded array, controller starts Auto-Rebuild immediately. And in RAID 6, if there is another disk failure occurs during rebuilding, controller will start the above Auto-Rebuild process as well. Auto-Rebuild feature only works at that the status of VG is "Online". It will not work at "Offline". Thus, it will not conflict with the "Roaming".
3. In degraded mode, the status of VG is "Degraded". When rebuilding, the status of VG/UDV will be "Rebuild", the column "R%" in UDV will display the ratio in percentage. After complete rebuilding, the status will become "Online". VG will become completely one.

 Tips : **"Set dedicated spare"** is not available if there is no VG or only VG of RAID 0, JBOD, because user can not set dedicated spare disk to RAID 0 & JBOD.






Sometimes, rebuild is called recover; they are the same meaning. The following table is the relationship between RAID levels and rebuild.

RAID 0	Disk striping. No protection for data. VG fails if any hard drive fails or unplugs.
RAID 1	Disk mirroring over 2 disks. RAID 1 allows one hard drive fails or unplugging. Need one new hard drive to insert to the system and rebuild to be completed.
N-way mirror	Extension to RAID 1 level. It has N copies of the disk. N-way mirror allows N-1 hard drives failure or unplugging.

RAID 3	Striping with parity on the dedicated disk. RAID 3 allows one hard drive failure or unplugging.
RAID 5	Striping with interspersed parity over the member disks. RAID 5 allows one hard drive failure or unplugging.
RAID 6	2-dimensional parity protection over the member disks. RAID 6 allows two hard drives failure or unplugging. If it needs to rebuild two hard drives at the same time, it will rebuild the first one, then the other in sequence.
RAID 0+1	Mirroring of RAID 0 volumes. RAID 0+1 allows two hard drive failures or unplugging, but at the same array.
RAID 10	Striping over the member of RAID 1 volumes. RAID 10 allows two hard drive failure or unplugging, but in different arrays.
RAID 30	Striping over the member of RAID 3 volumes. RAID 30 allows two hard drive failure or unplugging, but in different arrays.
RAID 50	Striping over the member of RAID 5 volumes. RAID 50 allows two hard drive failures or unplugging, but in different arrays.
RAID 60	Striping over the member of RAID 6 volumes. RAID 40 allows four hard drive failures or unplugging, every two in different arrays.
JBOD	The abbreviation of “ Just a Bunch Of Disks ”. No data protection. VG fails if any hard drive failures or unplugs.

4.2 VG migration and expansion

To migrate the RAID level, please follow below procedures.

1. Select “/ **Volume config / Volume group**”.
2. Decide VG to be migrated, click the button “  ” in the RAID column next the RAID level.
3. Change the RAID level by clicking the down arrow “ **RAID 5** ▾ ”. There will be a pup-up which shows if the HDD is not enough to support the new setting of RAID level, click “  ” to increase hard drives, then click “  ” to go back to setup page. When doing migration to lower RAID level, such as the original RAID level is RAID 6 and user wants to migrate to RAID 0, the controller will evaluate whether this operation is safe or not, and appear a message of “**Sure to migrate to a lower protection array?**” to give user warning.
4. Double check the setting of RAID level and RAID PD slot. If there is no problem, click “  ”.
5. Finally a confirmation page shows the detail of RAID info. If there is no problem, click “  ” to start migration. Controller also pops up a message of “**Warning: power lost during migration may cause damage of data!**” to give user warning. When the power is abnormally off during the migration, the data is in high risk.
6. Migration starts and it can be seen from the “status 3” of a VG with a running square and an “**M**”. In “/ **Volume config / User data volume**”, it displays an “**M**” in “**Status 4**” and complete percentage of migration in “**R%**”.

Name :

RAID Level :

RAID PD slot :

Figure 4.2.1

/ Volume config / Volume group

<input type="checkbox"/>	No.	Name	Total (GB)	Free (GB)	#PD	#UDV	Status	1	2	3	RAID
<input type="checkbox"/>	1	VG-R0	76	71	3	1	Online				RAID 5

Figure 4.2.2

(Figure 4.2.2: A RAID 0 with 2 physical disks migrates to RAID 5 with 3 physical disks.)

/ Volume config / User data volume

<input type="checkbox"/>	No.	Name	Size (GB)	Status	1	2	3	R %	RAID	#LUN	Snapshot (GB)	VG name	CV (MB)
<input type="checkbox"/>	1	UDV-R0	5	Online				12%	RAID 5	0	0.00/0.00	VG-R0	100


Figure 4.2.3

(Figure 4.2.3: A RAID 0 migrates to RAID 5, the complete percentage is 12%.)

To do migration, the total size of VG must be larger or equal to the original VG. It does not allow expanding the same RAID level with the same hard disks of original VG. During the setting migration, if user doesn't setup correctly, controller will pop up warning messages. Below is the detail of messages.



1. **Invalid VG ID:** Source VG is invalid.
2. **Degrade VG not allowed:** Source VG is degraded.
3. **Initializing/rebuilding operation's going:** Source VG is initializing or rebuilding.

4. **Migration operation's going:** Source VG is already in migration.
5. **Invalid VG raidcell parameter:** Invalid configuration. E.g., New VG's capacity < Old VG's capacity, New VG's stripe size < Old VG's stripe size. Or New VG's configuration == Old VG's configuration.
6. **Invalid PD capacity:** New VG's minimum PD capacity < Old VG's minimum PD capacity.

 Notice : VG Migration cannot be executed during rebuild or UDV extension.

4.3 UDV Extension

To extend UDV size, please follow the procedures.

1. Select “/ Volume config / User data volume”.
2. Decide which UDV to extend, click the button “  ” in the Size column next the number.
3. Change the size. The size must be larger than the original, and then click “  ” to start extension.
4. Extension starts. If UDV needs initialization, it will display an “I” in “Status 3” and complete percentage of initialization in “R%”.

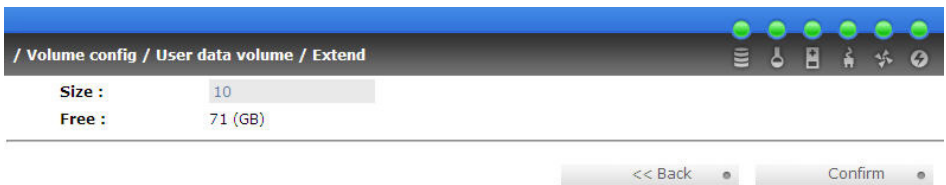


Figure 4.3.1

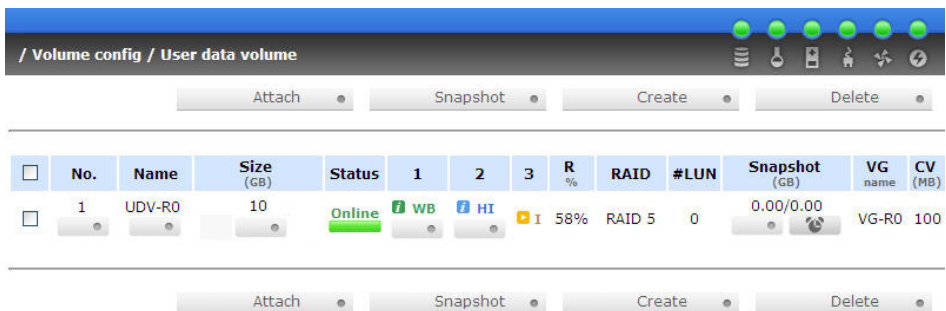



Figure 4.3.2

(Figure 4.3.2: Extend UDV-R0 from 5GB to 10GB.)

 Tips : The size of UDV extension must be larger than original.

 Notice : UDV extension cannot be executed during rebuild or migration.

4.4 Disk roaming

Physical disks can be re-sequenced in the same system or move all physical disks from system-1 to system-2. This is called disk roaming. Disk roaming has some constraints as described in the followings:

1. Check the firmware of two systems first. It is better that both systems have the same firmware version or newer.
2. All physical disks of related VG should be moved from system-1 to system-2 together. The configuration of both VG and UDV will be kept but LUN configuration will be cleared in order to avoid conflict with system-2.

Appendix

A. Certification list

• SAS HBA card

Vendor	Model
LSI Logic	SAS3442X (PCI-X, 3 Gb/s, 1 external x4 SFF 8470 , 1 internal x4 SFF 8484)
LSI Logic	SAS3442E-R (PCI-Express, 3 Gb/s, 1 external x4 SFF 8470 , 1 internal x4 SFF 8484)
LSI Logic	SAS3800X (PCI-X, 3 Gb/s, 2 external x4 SFF-8470)
LSI Logic	SAS3801E (PCI-Express, 3 Gb/s, 2 external x4 SFF-8088 mini-SAS)

• Hard drive

Supports SATA I, II disks.

Vendor	Model
Hitachi	Deskstar 7K250, HDS722580VLSA80, 80GB, 7200RPM, SATA, 8M
Hitachi	Deskstar E7K500, HDS725050KLA360, 500GB, 7200RPM, SATA II, 16M
Hitachi	Deskstar 7K80, HDS728040PLA320, 40GB, 7200RPM, SATA II, 2M
Hitachi	Deskstar T7K500, HDT725032VLA360, 320GB, 7200RPM, SATA II, 16M
Hitachi	Deskstar P7K500, HDP725050GLA360, 500GB, 7200RPM, SATA II, 16M
Maxtor	DiamondMax Plus 9, 6Y080M0, 80GB, 7200RPM, SATA, 8M
Maxtor	DiamondMax 11, 6H500F0, 500GB, 7200RPM, SATA 3.0Gb/s, 16M
Samsung	SpinPoint P80, HDSASP0812C, 80GB, 7200RPM, SATA, 8M
Seagate	Barracuda 7200.7, ST380013AS, 80GB, 7200RPM, SATA 1.5Gb/s, 8M
Seagate	Barracuda 7200.7, ST380817AS, 80GB, 7200RPM, SATA 1.5Gb/s, 8M, NCQ
Seagate	Barracuda 7200.8, ST3400832AS, 400GB, 7200RPM, SATA 1.5Gb/s, 8M, NCQ
Seagate	Barracuda 7200.9, ST3500641AS, 500GB, 7200RPM, SATA 3.0Gb/s, 16M, NCQ
Seagate	Barracuda 7200.11, ST31000340AS, 1000GB, 7200RPM, SATA 3.0Gb/s, 32M, NCQ
Seagate	NL35, ST3400633NS, 400GB, 7200RPM, SATA 3.0Gb/s, 16M
Seagate	NL35, ST3500641NS, 500GB, 7200RPM, SATA 3.0Gb/s, 16M
Seagate	Barracuda ES, ST3500630NS, 500GB, 7200RPM, SATA 3.0Gb/s, 16M
Seagate	Barracuda ES, ST3750640NS, 750GB, 7200RPM, SATA 3.0Gb/s, 16M
Seagate	Barracuda ES.2, ST31000340NS, 1000GB, 7200RPM, SATA 3.0Gb/s, 32M
Western Digital	Caviar SE, WD800JD, 80GB, 7200RPM, SATA 3.0Gb/s, 8M
Western Digital	Caviar SE, WD1600JD, 160GB, 7200RPM, SATA 1.5G/s , 8M
Western Digital	Raptor, WD360GD, 36.7GB, 10000RPM, SATA 1.5Gb/s, 8M
Western Digital	Caviar RE2, WD4000YR, 400GB, 7200RPM, SATA 1.5Gb/s, 16M, NCQ
Western Digital	RE2, WD4000YS, 400GB, 7200RPM, SATA 3.0Gb/s, 16M
Western Digital	Caviar RE16, WD5000AAKS, 500GB, 7200RPM, SATA 3.0Gb/s, 16M
Western Digital	RE2, WD5000ABYS, 500GB, 7200RPM, SATA 3.0Gb/s, 16M, NCQ

B. Event notifications

• PD events

Level	Type	Description
INFO	Disk inserted	Disk <slot> is inserted into system.
WARNING	Disk removed	Disk <slot> is removed from system.
ERROR	HDD failure	Disk <slot> is disabled.

• HW events

Level	Type	Description
WARNING	ECC error	Single-bit ECC error is detected.
ERROR	ECC error	Multi-bit ECC error is detected.
INFO	ECC info	ECC memory is installed.
INFO	ECC info	Non-ECC memory is installed.
INFO	SCSI info	Received SCSI Bus Reset event at the SCSI Bus <number>.

• EMS events

Level	Type	Description
INFO	Power installed	Power <number> is installed.
ERROR	Power absent	Power <number> is absent.
INFO	Power work	Power <number> is restored to work.
ERROR	Power warning	Power <number> is out of work.
WARNING	Power detect	PSU signal detection <number>.
INFO	Fan work	Fan <number> is restored to work.
ERROR	Fan warning	Fan <number> is out of work.
INFO	Fan installed	Fan <number> is installed.
ERROR	Fan not present	Fan <number> is not present.
WARNING	Thermal warning	System temperature <location> is a little bit higher.
ERROR	Thermal critical	System Overheated <location>!!!
ERROR	Thermal critical shutdown	System Overheated <location>!!! The system will do the auto shutdown immediately.
WARNING	Thermal ignore value	Unable to update thermal value on <location>.
WARNING	Voltage warning	System voltage <location> is a little bit higher/lower.
ERROR	Voltage critical	System voltages <location> failed!!!
ERROR	Voltage critical shutdown	System voltages <location> failed!!! The system will do the auto shutdown immediately.
INFO	UPS info	UPS detection succeeded.
WARNING	UPS error	UPS detection failed.
ERROR	UPS error	AC loss for the system is detected.
ERROR	UPS error	UPS Power Low!!! The system will do the auto shutdown immediately.
WARNING	SMART T.E.C.	Disk <slot> S.M.A.R.T. Threshold Exceed Condition occurred for attribute <item>.
WARNING	SMART failure	Disk <slot>: Failure to get S.M.A.R.T information.

• RMS events

Level	Type	Description
INFO	Console Login	<username> login from <IP or serial console> via Console UI.
INFO	Console Logout	<username> logout from <IP or serial console> via Console UI.
INFO	Web Login	<username> login from <IP> via Web UI.
INFO	Web Logout	<username> logout from <IP> via Web UI.

• LVM2 events

Level	Type	Description
INFO	VG created	VG <name> has been created.
WARNING	VG creation failed	Failed to create VG <name>.
INFO	VG deleted	VG <name> has been deleted.
INFO	VG renamed	VG <name> has been renamed to <name>.
INFO	UDV created	UDV <name> has been created.
WARNING	UDV creation failed	Failed to create UDV <name>.
INFO	UDV deleted	UDV <name> has been deleted.
INFO	UDV renamed	Name of UDV <name> has been renamed to <name>.
INFO	Read-only caching enabled	Cache policy of UDV <name> has been set as read only.
INFO	Writeback caching enabled	Cache policy of UDV <name> has been set as write-back.
INFO	Write-through caching enabled	Cache policy of UDV <name> has been set as write-through.
INFO	UDV extended	Size of UDV <name> extends.
INFO	LUN attached	UDV <name> has been LUN-attached.
INFO	LUN attachment failed	Failed to attach LUN to UDV <name>.
INFO	LUN detached	UDV <name> has been detached.
INFO	LUN detachment failed	Failed to attach LUN from bus <number>, SCSI ID <number>, lun <number>.
INFO	UDV initialization started	UDV <name> starts initialization.
INFO	UDV initialization finished	UDV <name> completes the initialization.
WARNING	UDV initialization failed	Failed to complete initialization of UDV <name>.
INFO	UDV rebuild started	UDV <name> starts rebuilding.
INFO	UDV rebuild finished	UDV <name> completes rebuilding.
WARNING	UDV rebuild failed	Failed to complete rebuild of UDV <name>.
INFO	UDV migration started	UDV <name> starts migration.
INFO	UDV migration finished	UDV <name> completes migration.
ERROR	UDV migration failed	Failed to complete migration of UDV <name>.
INFO	VG migration started	VG <name> starts migration.
INFO	VG migration finished	VG <name> completes migration.
INFO	UDV rewrite started	Rewrite at LBA <address> of UDV %s starts.
INFO	UDV rewrite finished	Rewrite at LBA <address> of UDV %s completes.
WARNING	UDV rewrite failed	Rewrite at LBA <address> of UDV %s failed.
WARNING	VG degraded	VG <name> is under degraded mode.
WARNING	UDV degraded	UDV <name> is under degraded mode.

ERROR	VG failed	VG <name> is failed.
ERROR	UDV failed	UDV <name> is failed.
ERROR	Recoverable read error occurred	Recoverable read error occurred at LBA <address>-<address> of UDV <name>.
ERROR	Recoverable write error occurred	Recoverable write error occurred at LBA <address>-<address> of UDV <name>.
ERROR	Unrecoverable read error occurred	Unrecoverable read error occurred at LBA <address>-<address> of UDV <name>.
ERROR	Unrecoverable write error occurred	Unrecoverable write error occurred at LBA <address>-<address> of UDV <name>.
ERROR	PD config read failed	Config read failed at LBA <address>-<address> of PD <slot>.
ERROR	PD config write failed	Config write failed at LBA <address>-<address> of PD <slot>.
ERROR	Global CV adjustment failed	Failed to change size of the global cache.
INFO	Global cache OK	The global cache is ok.
ERROR	Global CV creation failed	Failed to create the global cache.
INFO	Dedicated spare configured	PD <slot> has been configured to VG <name> as a dedicated spare disk.
INFO	Global spare configured	PD <slot> has been configured as a global spare disk.
ERROR	PD read error occurred	Read error occurred at LBA <address>-<address> of PD <slot>.
ERROR	PD write error occurred	Write error occurred at LBA <address>-<address> of PD <slot>.
INFO	PD freed	PD <slot> has been removed from VG <name>.
INFO	VG imported	Configuration of VG<name> has been imported.
INFO	VG restored	Configuration of VG <name> has been restored.
INFO	UDV restored	Configuration of UDV <name> has been restored.

• Battery backup events

Level	Type	Description
INFO	BBM sync data	Abnormal shutdown detected, start flushing battery-backup data (<number> KB).
INFO	BBM sync data	Abnormal shutdown detected, flushing battery-backup data finishes.
INFO	BBM detected	Battery backup module is detected.
INFO	BBM is good	Battery backup module is good.
INFO	BBM is charging	Battery backup module is charging.
WARNING	BBM is failed	Battery backup module is failed.
INFO	BBM	Battery backup feature is <item>.

• JBOD events

Level	Type	Description
INFO	Disk inserted	JBOD <number> disk <slot> is inserted into system.
WARNING	Disk removed	JBOD <number> disk <slot> is removed from system.
ERROR	HDD failure	JBOD <number> disk <slot> is disabled.
INFO	JBOD inserted	JBOD <number> is inserted into system
WARNING	JBOD removed	JBOD <number> is removed from system
WARNING	SMART T.E.C	JBOD <number> disk <slot>: S.M.A.R.T. Threshold Exceed Condition occurred for attribute %s

WARNING	SMART Failure	JBOD <number> disk <slot>: Failure to get S.M.A.R.T information
INFO	Dedicated spare configured	JBOD <number> PD <slot> has been configured to RG <name> as a dedicated spare disk.
INFO	Global spare configured	JBOD <number> PD <slot>d has been configured as a global spare disk.
WARNING	PD read error occurred	Read error occurred at LBA <address>-<address> of JBOD <number> PD <slot>.
WARNING	PD write error occurred	Write error occurred at LBA <address>-<address> of JBOD <number> PD <slot>.
INFO	PD freed	JBOD <number> PD <slot> has been removed from RG <name>.

• System maintenance events

Level	Type	Description
INFO	System shutdown	System shutdown.
INFO	System reboot	System reboot.
INFO	FW upgrade start	Firmware upgrade start.
INFO	FW upgrade success	Firmware upgrade success.
WARNING	FW upgrade failure	Firmware upgrade failure.

C. Installation steps for large volume (TB)

Introduction:

Sans Digital AR108X SAS RAID are capable of supporting large volumes (>2TB) on all product lines. When connecting controllers to 64bit OS installed host/server, the host/server is inherently capable for large volumes from the 64bit address. On the other side, if the host/server is installed with 32bit OS, user has to change the block size to 1KB, 2KB or 4KB to support volumes up to 4TB, 8TB or 16TB, for the 32bit host/server is not LBA (Logical Block Addressing) 64bit supported. For detail installation steps, please refer to following steps below.

Step 1: Configure target

1. Prepare the hard drivers which capacity is over 2TB totally. Follow the example in chapter 3 to create a VG/UDV. Then attach LUN.



Tips : If the OS is 64bit, user can set the block size to any available value. If the OS is 32bit, user must change the block size to larger values than 512B. There will be a confirmation pop-up message when VD size is over 2TB.

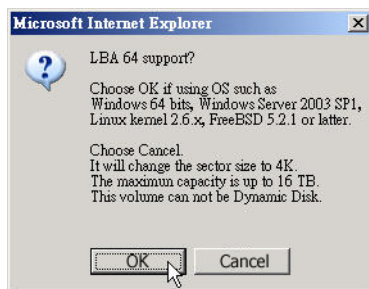



Figure C.1

(Figure D.1: choose “OK” for 64bit OS, choose “Cancel” for 32bit OS, this step will change block size to 4K automatically.)

2. Click the button “” in “No.” column to see “More information”. Look at block size is 512B for 64bit OS setting, 4K for 32bit OS setting.

Step 2: Configure host/server

1. Follow the installation guild provided by HBA vendor, install HBA driver properly. For iSCSI models, please install the latest Microsoft iSCSI initiator from the link below.

<http://www.microsoft.com/downloads/details.aspx?FamilyID=12cb3c1a-15d6-4585-b385-befd1319f825&DisplayLang=en>

Step 3: Initialize/Format/Mount the disk

1. Go to Start → Control Panel → Computer Management → Disk Management, it displays a new disk.

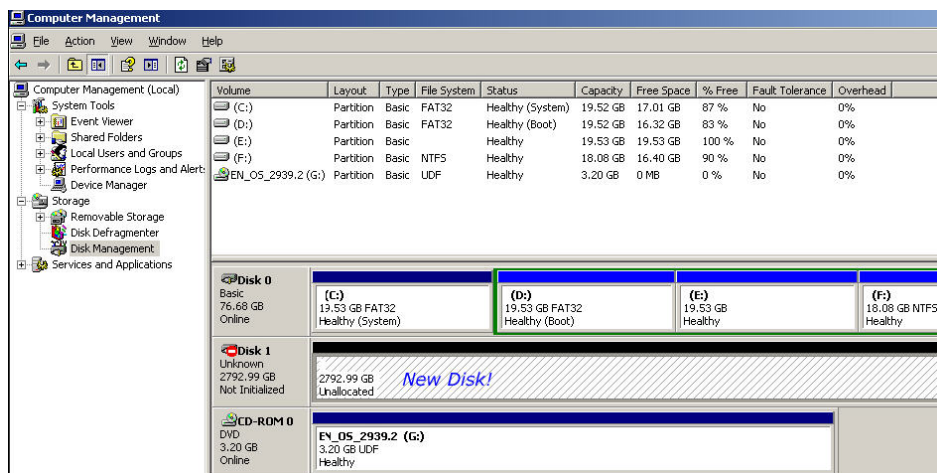


Figure C.2

2. Initialize the disk.

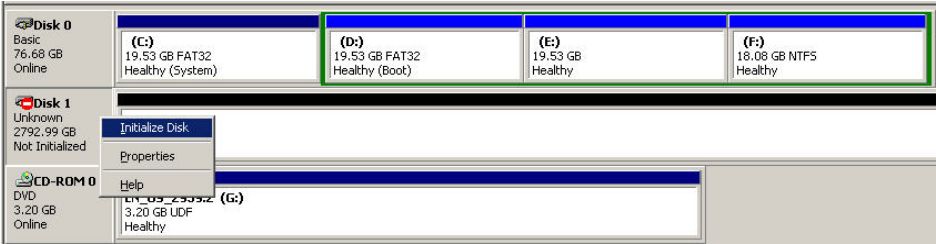


Figure C.3

3. Convert to GPT disk for over 2TB capacity. For more detail information about GPT, please visit

http://www.microsoft.com/whdc/device/storage/GPT_FAQ.msp

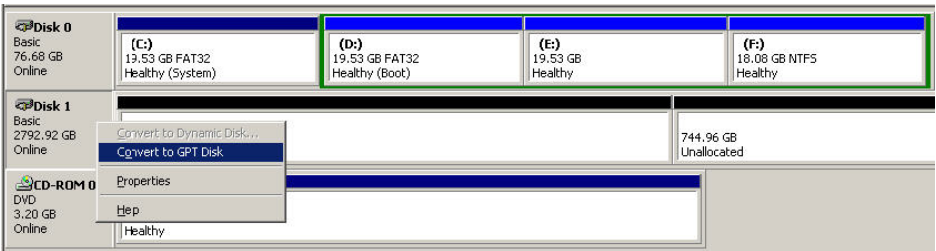


Figure C.4

4. Format the disk.

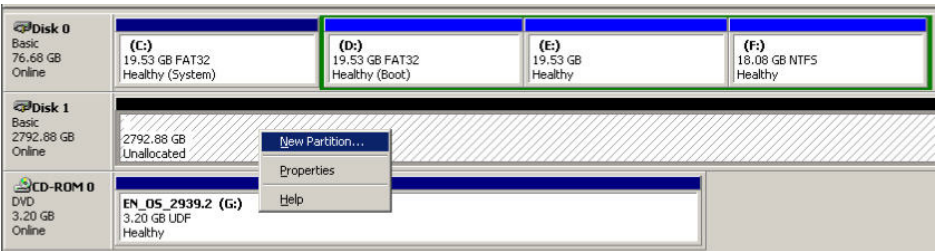


Figure C.5

5. Done.

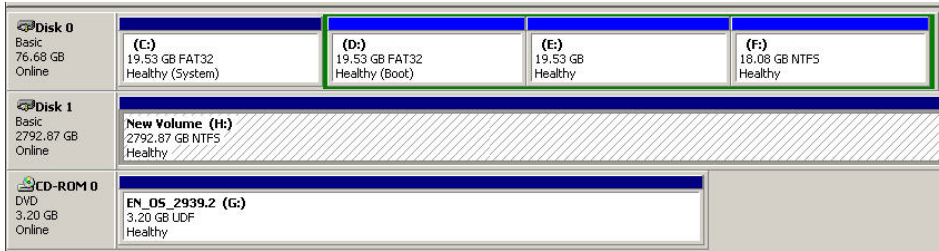


Figure C.6

6. The new disk is ready to use, the available size = 2.72TB.

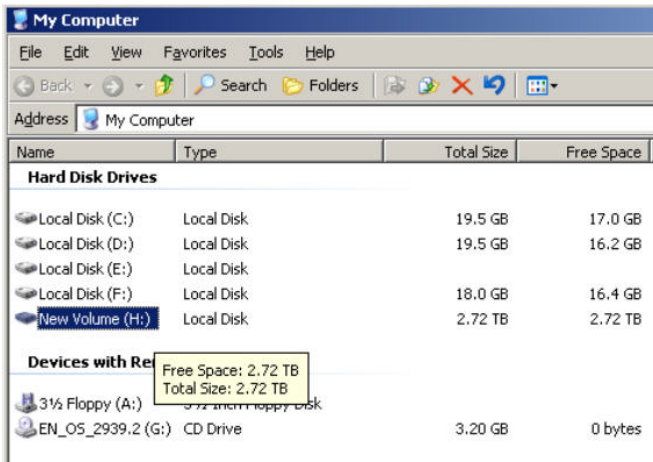


Figure C.7

Notice : If user setups 512B block size for VD and the host/server OS is 32bit, in the last step of formatting disk, user will find OS can not format the disk sector after 2048GB (2TB).

7. Wrong setting result: OS can not format disk sector after 2048GB(2TB).

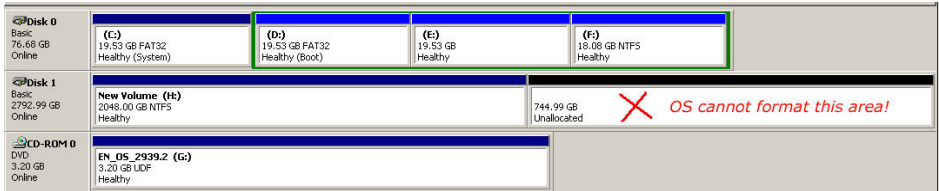


Figure C.8

System information

	Sans Digital AccuRAID Series AR108X SAS RAID
SW version	2.3.1